

REMARKS

Applicants appreciate the thorough examination of the application as evidenced by the Office Action dated August 31, 2006. Claims 28-32 stand rejected under § 102(e) as being anticipated by U.S. Patent No. 6,800,542 to Kim ("Kim") and Claims 33-36 stand rejected under § 102(e) as being anticipated by U.S. Patent Publication No. 2005/0124154 to Park et al. ("Park"). In response, Claim 28 has been amended. Applicants respectfully request reconsideration of the rejections for the reasons that follow.

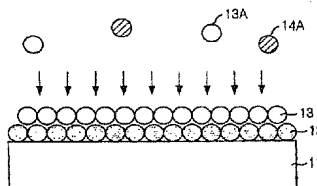
Claims 28-32 are not anticipated by Kim

Claim 28 recites a conductive structure including:

- a first conductor;
- a plurality of atomic layers of a second conductor directly on the first conductor; and
- a first solid material directly on the plurality of atomic layers of the second conductor, remote from the first conductor, the first material being penetrable by the plurality of atomic layers of the second conductor relative to at least a second material other than the second conductor.

Applicants submit that Kim does not disclose at least the underlined portion of independent Claim 28. The Action takes the position that components **13A** and **14A** are the "first material" and that component **13** is the "plurality of atomic layers of the second conductor." See the Action, page 2. However, in discussing **Figure 1B** (reproduced below), column 3, lines 47-55 of Kim refers to **Figure 1B** as follows:

FIG. 1B



As shown in **FIG. 1B**, hydrazine (N_2H_4) **13**, which is a reaction gas, is injected ... and ... is reacted with Ru precursor **12** absorbed on the surface of the substrate **11** so that the Ru and volatile by-products, such as HX, NH_3 and N_2 are produced.... [T]he purge gas is injected again in order to remove the volatile by products **14A** and a non-reacted hydrazine **13A** and a highly pure Ru thin layer is finally deposited.

Therefore, the by-products **14A** and a non-reacted hydrazine **13A** of Kim, which are removed from the reaction chamber, are a solid material as recited in Claim 28, and Claim 28 is patentable for at least these reasons. Claims 29-32 are patentable at least as depending from patentable Claim 28.

Claims 33-36 are not anticipated by Park

Claim 33 recites a conductive structure including:

- a first layer comprising ruthenium;
- a second layer comprising a plurality of atomic layers of copper directly on the first layer comprising ruthenium; and
- a third layer comprising iodine directly on the second layer comprising a plurality of atomic layers of copper, remote from the first layer comprising ruthenium.

Applicants submit that Park does not disclose various recitations of Claim 33. The Action takes the position that the barrier layer **330** is the "first layer comprising ruthenium" the adhesion layer **340** is the "second layer comprising a plurality of atomic layers of copper," and the layer **370** is the "third layer comprising iodine." *See* the Action, pages 3-4.

Park discusses that the barrier layer **330** may be formed of ruthenium. *See* Park, paragraph 22. However, Park proposes various materials that could be used as the adhesion layer **340** (also labeled **240a/240b**), but does not discuss copper. *See* paragraph 25 (discussing various materials for the adhesion layer, *e.g.*, ruthenium, rhenium, nickel, palladium, osmium, iridium and platinum, tantalum, tantalum alloys, titanium, titanium alloys, tungsten and tungsten alloys). The layer **360** in Park is described as a copper layer, and the catalyst **250b** is identified as iodine. *See* Park, paragraphs 29-30. However, the layer **360** is not "directly on the first layer comprising ruthenium" as recited in Claim 33 because the adhesion layer **340** in Park is between the ruthenium barrier layer **330** and the copper layer **360**.

FIG. 2B

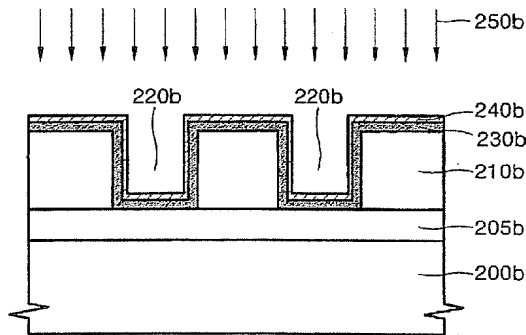
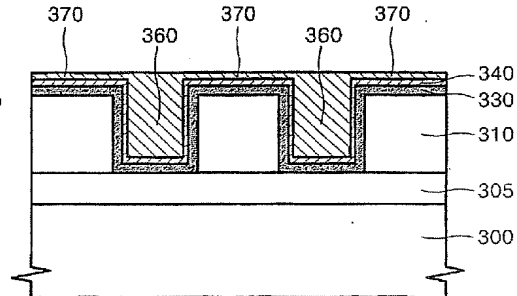


FIG. 3



Additionally, the iodine catalyst **250b** of Park is not directly on the copper layer **360/370** and remote from layers **230** or **240**. Park discusses depositing a copper layer with an iodine or iodine compound as a catalyst. *See* paragraph 13. As shown in **Figures 2B** and **3**, the iodine catalyst **250b** is deposited before the copper layer **360/370** so that it is not remote from layers **230** or **240**. As noted in Park in paragraphs 29-30 (emphasis added):

[A] semiconductor substrate **200b**, on which an adhesion layer **240b** is preformed, is treated with iodine or iodine compound as a catalyst **250b**.

Referring to **FIG. 3** subsequently, a copper layer **360** is formed using (hfac)Cu(vtms) as a copper precursor on the surface of an adhesion layer **340** by using said chemical vapor deposition method.

Therefore, Park does not teach or suggest a "third layer comprising iodine directly on the second layer comprising a plurality of atomic layers of copper, remote from the first layer comprising ruthenium" as recited in Claim 33, and Claim 33 is patentable for at least these reasons. Claims 34-36 are patentable at least as depending from patentable Claim 33.

Conclusion

Applicants have now shown that Kim does not include a first material that is configured as recited in independent Claim 28, and Park does not include a third layer comprising iodine that is configured as recited in independent Claim 33.

Accordingly, all pending claims are patentable for at least the above reasons, and Applicants respectfully request allowance of the present application.

In re: Jeffry A. Kelber et al.
Serial No.: 10/785,615
Filed: February 24, 2004
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Respectfully submitted,



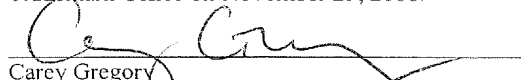
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